

ABSTRACT OF THE DISCLOSURE

A molecule assigning a genotype to a phenotype, which comprises a nucleic acid portion having a nucleotide sequence reflecting the genotype, and a protein portion comprising a protein involved in exhibition of the phenotype, a 3'-terminal end of the nucleic acid portion and a C-terminal end of the protein portion being covalently bound, and a method for constructing the molecule for assigning the genotype to the phenotype, which comprises (a) preparing a DNA containing a gene which has no termination codon, (b) transcribing the prepared DNA into RNA, (c) bonding a chimeric spacer composed of DNA and RNA to a 3'-terminal end of the obtained RNA, (d) bonding, to a 3'-terminal end of the obtained bonded product, a nucleoside or a substance having a chemical structure analogous to that of a nucleoside, which can be covalently bound to an amino acid or a substance having a chemical structure analogous to that of an amino acid, and (e) performing protein synthesis in a cell-free protein synthesis system using the obtained bonded product as mRNA to bond a nucleic acid portion containing the gene to a translation product of the gene. The molecule assigning the genotype to the phenotype of the present invention is an extremely useful substance that can be used for evolutionary molecular engineering, i.e., modification of functional biopolymers such as enzymes, antibodies, and ribozymes, and creation of biopolymers having functions which cannot be found in living organisms.